

Accelerator Systems Division Highlights for the Two Weeks Ending August 16, 2003

ASD/LANL: Warm Linac

August 8, 2003

HIGH-POWER RF (WBS 1.4.1.1)

Accomplishments This Week: (1) The 6th (of 14) SC linac transmitter system was delivered to ORNL one month ahead of schedule; LANL reviewed and accepted factory data from the 7th unit and approved shipping from Titan to ORNL. (2) LANL started testing the DTL klystron S/N 8. A heat run is underway at 2.4 MW. (This is the 8th and final klystron to undergo site acceptance tests at LANL; the final three will be shipped directly from E2V to ORNL.) (3) LANL completed the bake out our last two DTL windows (S/N4 and 1). The vacuum is excellent (4E-9 Torr) and conditioning is imminent. (4) CPI is preparing to test SCL klystron S/N 31 on their new test stand. They are working on resolving discrepancies between the old test stand and the new test stands, and installed a voltage regulator.

Concerns & Actions: (1) The Thales 5-MW klystrons for the CCL remain our most important issue. Tube S/N 3 is in transit from Thales to LANL, and currently is in Houston waiting to clear US Customs. (2) DTL klystron S/N 8 is not making the required power (2.4 MW compared to the required 2.5 MW). E2V is sending us tuning posts to install to try to increase the power. (3) E2V informed us that there might be a vacuum problem the next tube scheduled for factory tests. This would delay the factory tests date. Impact to SNS is minimal since SNS/ORNL has a complete inventory for the DTL and RFQ on hand.

HIGH-VOLTAGE POWER CONDITIONING (WBS 1.4.1.2)

Accomplishments: We continued to review and approve component acceptance test data from Dynapower, in preparation for the factory acceptance tests of the 14th and 15th (of 17) HV converter modulators in two weeks. Delivery to ORNL remains ahead of installation.

Concerns & Actions: The SCR controller failures at LANL reported last week appear to be due to spurious SCR triggering and a marginal snubber circuit. The unit is being modified.

DRIFT-TUBE LINAC (WBS 1.4.2)

Accomplishments - Tank-4: Drift tube cap and water channel repair welds are underway at Hanford. Forecast delivery dates are as follows: 4A - 9/23/03; 4B - 9/25/03; 4C - 9/29/03; 4D - 10/03/03. Hanford will be going to overtime so we may pick up schedule.

Tank-5: All internal cavity machining and stress relief complete on groups E, F and G are complete, as are water channel weld repair preparations for group E.

Tank-6: (1) Water channel welds are complete and stress relief is complete for group 6 H and water channel welds are complete for group 6I. Group 6I is being stress relieved at Bodycote. (2) Waveguide iris exterior machining is underway at CMI: machining of the nose is complete and it is awaiting completion of the vacuum portholes. The unit goes to plating on 8/8.

Tank 2: Machining and brazing work continues at ESCO, Bodycote and LANL. Diverter-to-body brazing is underway at LANL for group J. Groups K & L are ready for diverter to body brazing with the diverter to body brazing machining preparation work for group M still in progress. Groups K & L went to Bodycote for brazing on 8/8. Water channel welds are scheduled to begin the next week. (2) Waveguide iris exterior machining is mostly complete; the unit went for vacuum port joint plating.

Tank 3: Waveguide iris equatorial brazes was completed and the unit went to CMI for external machining.

EMD DT's: Drift tube welding commenced at Sciaky on 8/4 (Fig. 1) and is going well. After 3 days and 6 shifts, 89 welds were made. The first 16 drift tubes were shipped back to LANL for the next stage of fabrication.

BPM DT's: Internal parts for all units are complete and tested. All coolant jackets are brazed and are out for machining. Diverter, stems and end caps are ready and we are in the process of fitting stems and drift tubes in preparation for brazing (Fig. 2). Brazing is scheduled for completion 8/20.

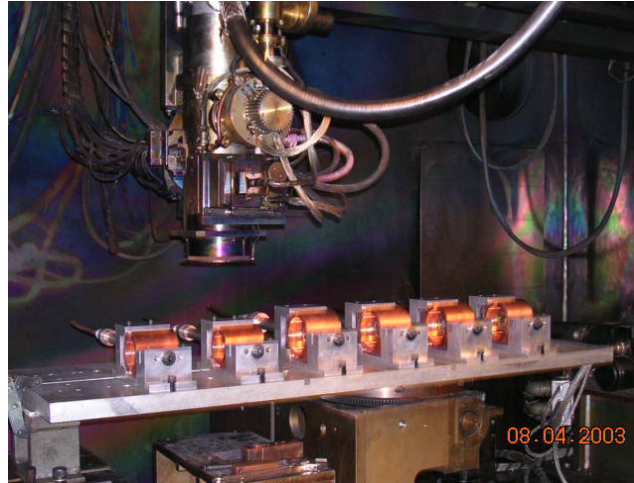


Fig. 1: EMD Drift tubes loaded in e-beam welder.



Fig. 2: Seven BPM drift tubes undergoing fit checks in preparation for brazing.

Beam Boxes: Box 3/4 went to the welder on 8/8; final machining begins on 8/11. The possible change in tank assembly order may prompt us to reschedule (reorder) the delivery dates of the remaining beam boxes.

Issues and Concerns: (1) We are concerned about the delivery schedule of the Tank-2, 4-6 PMQ and empty drift tubes. Current projections still show a 6-week delay. We are looking at all options to recover (e.g., 2 shift operation at Hanford, braze operations near ESCO, elimination of dummy DTs) and in preventing further slippage. (2) Due to electrical failures of magnets during shipping and EMD manufacturing we continue to be short or at zero spares of horizontal magnets. We are making arrangements to return failed magnets to Milhous for repair attempts; in addition Milhous fabricated parts for one more magnet than our order quantity and we will buy this unit and have it made into a horizontal magnet. (3) There is a potential conflict between tank 4 and tank 2 drift tubes for final processing resources at LANL. We will continue to monitor progress and need to develop a contingency plan. (4) We transmitted to ORNL the drawing files which describe the tooling and fixtures we designed to aid in drift tube installation. We strongly recommended that this tooling be made and used for the installation of tank 2, 4, 5 and 6 drift tubes. Failure to make and use this or similar tooling puts personnel and drift tubes at unnecessary risk. The LANL SNS drift tube fabrication organization will be mostly disbanded by the time the tank 5 and tank 6 drift tube installation is underway. It will be difficult to assist with repairs or replacements if a drift tube is damaged in an installation accident

COUPLED CAVITY LINAC (WBS 1.4.4)

Accomplishments: (1) Eleven (of twelve) module-1 segments are all in place (Fig. 3); the 12th is almost finished with its dimple tuning. The first half will be under vacuum on 8/8. LANL and ORNL will be at ACCEL next week to through the remaining components with assembly to get a total test.

Concerns & Actions: The rate of progress in tuning CCL module 1 at ACCEL is too slow. We continue to work with ACCEL to ensure that their staff satisfactorily comes up to speed. The impact on schedule is being evaluated.



Fig. 3: CCL Module-1 at ACCEL.

PROJECT MANAGEMENT (WBS 1.4.5)

Bob Hardekopf has been named Acting Deputy Division Leader for LANL SNS Division, replacing John Bretzke. Bob's appointment comes at an important time as we complete our obligations to the project and close down the Division over the coming months. He is no stranger to SNS, having been part of the LANL effort since 1997. Since that time, he has served as our R&D Manager, Project Leader, and LANL Senior Team Leader. Prior to SNS, Bob enjoyed a distinguished career at LANL as Deputy Division Leader, Group Leader, and TSM in the Accelerator Technology and Physics Divisions. Bob is a former officer in the US Navy, and he holds a PhD in Nuclear Physics from Duke University and an Executive MBA from the Univ. of New Mexico.

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HIGH-POWER RF (WBS 1.4.1.1)

Accomplishments This Week: (1) We conditioned two DTL windows to full power. The 4-hour heat run will commence when we complete tuning the klystron (see below). (2) CPI is ready to test SCL klystron S/N 31 next week. (3) We witnessed factory acceptance tests of SCL transmitter S/N 8.

Concerns & Actions: (1) The Thales 5-MW klystrons for the CCL remain our most important issue. Tube S/N 3 arrived at LANL. The magnets and sockets are installed on our test stand and we are currently installing the tube. (2) DTL klystron S/N 8 is not making the required power (2.4 MW compared to the required 2.5 MW). We received the tuning post set from E2V and are in the process of trying different tuning posts. The original 15-mm tuning post on the T-bar was replaced with a 20-mm one, and output power increased by ~ 15 kW. We installed a 30-mm post and are testing it now. (3) E2V has achieved acceptable vacuum on DTL klystron S/N 7; we are on track for the factory test on 9/8.

HIGH-VOLTAGE POWER CONDITIONING (WBS 1.4.1.2)

Accomplishments: (1) We reviewed subassembly data for the 14th and 15th (of 17) production HV converter modulators (HVCM). Results are satisfactory, and we are on schedule to witness factory acceptance tests on 8/18. (2) The prototype HVCM at LANL ran without problems to support DTL klystron testing and window conditioning.

Concerns & Actions: The Dynapower SCR controller mistriggering failures at high average power tests at LANL continues to attract most of our attention. We drafted a recovery plan and have submitted it to the vendor. Improvements to the snubbers on filter chokes and output diodes did not satisfactorily treat the problem. We have initiated a design and fabrication of low-capacitance trigger driver isolation transformers and are analyzing the SCR dV/dt and dI/dt ratings.

DRIFT-TUBE LINAC (WBS 1.4.2)

NOTE: ORNL informed LANL on 8/14 of a new commissioning sequence, where DTL Tanks 1, 2, and 3 will be commissioned together in 12/03. We were directed to alter our deliver sequence, whenever possible, from Tanks 4, 5, 6, and 2 to Tanks 2, 5, 6, and 4. We will now report progress according to the new sequence.

Accomplishments - Tank-2: (1) Group J water channel welding was finished and dispatched to Bodycote for stress relief. Group K will undergo diverter to body brazing on 8/18 at Bodycote. Group K water channel welding is planned for 8/20. Groups L and M are ready for diverter to body brazing. Diverters for group M will be finished at

Bodycote 8/20. Modification of existing stems and the manufacture of new stems continue. (2) Waveguide final plating is complete and the unit is at LANL; final brazing is scheduled for next week. Projected delivery date to ORNL is 9/24.

Tank 4: Drift tube groups 4A and 4B cap and water channel repair welds were completed at Hanford. Group 4A will ship today to CMI for final profiling. Group 4C cap and water channel repair welding will start at start at Hanford on 8/18. Tank 4 stems were completed except for coining of copper ring by CMI. (2) We were directed by ORNL to cease work on the dummy drift tubes; that work will cease.

Tank 5: (1) All required water channel weld repair preparations are complete. Magnets are scheduled to be loaded into drift tubes on 8/18 followed by cap installation. (2) We were directed by ORNL to cease work on the dummy drift tubes. With the exception of finishing up the water channel weld repairs on a few units; that work will cease.

Tank 6: Stress relief was completed for all drift tubes for group 6 H and water channel welds are complete for group 6I. Group 6I being stress relieved at Bodycote. (2) We were directed by ORNL to cease work on the dummy drift tubes; that work will cease. (3) Waveguide final plating is complete and the unit is at LANL; final brazing is scheduled for next week. Projected date for delivery to ORNL is 9/16.

Tank 3: Waveguide has gone for final plating and the unit is expected imminently at LANL. Final brazing is scheduled for next week. Projected delivery date to ORNL is 10/02.

Hydrogen Brazing Operations at LANL are drawing to a close (last planned heats are next week), but we will defer the decommissioning of the furnace facility until all the DTL parts are delivered to ORNL (mid to late October).

EMD and BPM DT's: Welding will resume next week at Sciaky; the end walls and beam tubes for a number of units should be completed. We are endeavoring to get drift tube 2-39 vertical (unit required rework due to a bad magnet) caught up with the production stream. Final welding episode is planned at Sciaky on 9/8. Currently delivery to ORNL of tank 2, 6 and 5 drift tubes is projected to be 10/1.

Beam Boxes: Box 3/4 post weld machining is underway; there were a few minor tolerancing problems due to weld warpage but these have been worked out. We need to reschedule (change the manufacturing order) the delivery dates of the remaining beam boxes: 1/2 and 2/3 needed next after 3/4

Concerns & Actions: (1) We lost a key member of the SNS mechanical fabrication team for personal reasons. Another technician has been added. (2) Bodycote is now the bottleneck for Tank-2 drift tube production; we are considering dispatching someone there to monitor the work. (3) There are no spare horizontal EMD magnets on hand.

COUPLED CAVITY LINAC (WBS 1.4.4)

Accomplishments: (1) We continued to be at ACCEL this week. The first half of Module-1 was pumped down and successfully leak tested. Work on the second half is underway.

Concerns & Actions: (1) We continue to be concerned about ACCEL's ability to tune the CCL. Expectations were communicated in writing to ACCEL management. We will evaluate progress weekly. (2) Delays at ACCEL have created a resource conflict. We are presently using one of the three SNS laser trackers at ACCEL for assembly of the CCL modules. The original plan was to have this unit at ACCEL through Oct 2003. It appears that we will require a tracker an additional three months. We are exploring possible work-arounds, *e.g.*, the LANSCE-2 alignment team using theodolites at LANL, lease other equipment or direct ACCEL to purchase or lease this equipment, forgoing any additional module assembly at ACCEL after October and move all assembly activities to ORNL where we would have the possibility of time sharing with the available units there. We will make cost and schedule estimates for these options to enable a decision on how to proceed.

PHYSICS & DIAGNOSTICS (WBS 1.4.5)

Accomplishments: (1) We thank A. Ratti of LBNL who will check measurements of lobe/connector resistances for the CCL BPMs at ESCO in Concord. The DTL BPMs still require some cable work but will be ready for welding, which is expected to happen the week of 9/8. (2) All three MEBT BPM chassis brought back from ORNL were repaired and are ready to return to ORNL. Primary failures were trace errors on the pc boards, which were made more robust in the latest versions of these boards ordered. J. Power will take the repaired units to ORNL next week and spend at least a week helping to install and test them. In addition, he will troubleshoot the other three MEBT BPM units that have malfunctioned. (3) We received 13 (of 25) BPM AFEs ordered from Bergoz (to support the DTL and CCL units). We received a quote from Suntron on assembly of the BPM production boards. Because of uncertainty created by the failures experienced on the MEB units, we decided to order only 15 production units at this time, enough for the DTL plus a few spares. The final order of about 70 units will be placed after a thorough evaluation of the MEBT units. (4) We received notification from the vendor that they will ship the SMA

feedthroughs for the DTL CMs this week. All parts will then be on hand and will be delivered to the DTL team for shipment to ORNL along with the beam boxes.

ASD/JLAB: Cold Linac

Testing of the M-3 cryomodule has been on hold for two weeks because of a problem with the 1 MW RF system.

The two cavities tested at high power have both performed extremely well.

Cryomodule M-4 has been completed and is in storage.

Cryomodule M-5 has been completed and will be tested as soon as M-3 testing is complete.

The M-6 cold mass has been completed and inserted into the space frame.

One cavity is qualified for the M-7 cryomodule.

ASD/BNL: Ring

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Vendor progress:

- Tesla remains on track to ship eight (8) 21Q40s to SNS/OR on Monday, August 11, 2003. Some quad frames will likely be included in the shipment.
- NETC – vacation shutdown this week. Chicane #3 to ship to BNL next week.
- Alpha Magnetics – one (1) 21S26 and two 41CDM30s were received at BNL this week. Delivery of the 26S26 production magnets should start in early September.
- SDMS - efforts continue to reduce cost; we hope to award a contract by mid August. RTBT collimator #1 will depart SDMS for SNS/OR on 8/14/03.

Magnetic measurements of the first production unit 30Q58 were completed this week. The magnetic field was measured using an existing harmonic coil that was modified to measure fields at a larger radius (12.78 cm). The data includes harmonic terms at radius = 10 cm for 1.0 and 1.3 GeV fields; duodecapole (first allowed harmonic) versus current; and the field integral versus current.

The final shipment of ten (10) low field power supplies was received at SNS/OR this week closing out the BNL order with Danfysik (BNL PO # 0000042443).

The BNL Diagnostics Group completed another iteration of equipment spare parts. In addition, they have also been working on manpower and material estimates for FY04 and FY05.

The SNS Project Office conducted a Performance, Schedule and Cost review of BNL/SNS on Aug. 7th.

A redesigned lifting fixture for half-cell magnets was sent to ASD this week for review and comments.

We are working on interchangeability of the vacuum beam pipes for the Ring 2 & 3 collimators.

Work continues on ASD's remote clamp design and integration with the Ring primary collimator.

Testing of the Ring's third RF cavity is complete. Set-up of the low level system for dynamic tuning is next.

Design room efforts continue on the HEBT quad, dipole and collimator installation/assembly drawings in support of ASD's installation efforts.

Mag measure continues on 26Q40, 30Q44, 30Q58 and 21S26. For the 26Q40, all magnets have had base-line measurements; two of these have been shimmed and are being re-measured while a third requires realignment of a pole.

Work continues to update and expand the magnet parameter spread sheets to include measured resistance, power requirements, PS matching, heat loads and water flow.

Magnet connections, based on required polarities and magnet orientation, are being generated.

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Tesla - shipped eight (8) 21Q40s to SNS/OR on Monday, August 11, 2003. Five quad frames were also shipped. BNL will work with Tesla to expedite shipment of the remaining three frames.

Alpha Magnetics – all 41CDM30s have been received at BNL; 3 have been returned for repairs.

Ring Primary Collimator – three bids were received this week. SDMS was the successful bidder and has been awarded the production contract.

RTBT Collimator #1 was shipped to SNS/OR by SDMS (ETA is 3 weeks; D. Graves has been notified).

Last shipment of 4 large aperture quads (3 short/1 long plus spare coils) departed BINP for BNL.



LLRF testing is underway using cavity #3 as load.

BNL designers plan to release HEBT installation drawings up to Q34 within a week.

Power supply issues:

- Our vendor, IE Power, has a very active schedule for power supply testing in September and October. Three visits have been set up for factory acceptance testing.
- We are awaiting an “as pulled” cable list for the ring service building in order to include latest cable lengths (voltage drop) with power supply matching.
- IPM Power Supplies – need a unified decision on power supply selection for the IPMs to finalize vendor agreements on the Medium Range PS and the control and interface modules (PSI/PSC).

- Reposition of the RTBT rad hard quads – need a final decision soon since repositioning the doublets could affect the power supply rating.

Controls

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All remaining ARR test plans and procedures were executed and signed off this week, and given to the DCC for entry into ProjectWise. This included a number of tests related to the D-Plate. Three ARR presentations (PPS, MPS and Global Controls) were submitted to operations in preparation for the review. The Control System is ready.

The controls group hosted a small workshop on SCL Vacuum System controls, with participants from JLab, LANL and ORNL. The system was examined from stem to stern, design difficulties resolved and responsibilities identified. A game plan for testing the first rack with all software by Sep 30 was developed.

The proximity card reader that controls the door latch to the PPS entry station area has been installed. The unit will be programmed with prox card numbers of trained personnel and will eventually be connected to the ORNL Network to allow the unit to be updated remotely. This device will provide access control to the DTL1/DTL3 area and insure that only trained personnel are allowed entry.

Cable trays are being added on the eastern half of the Klystron gallery to support PPS cable runs from the south to the north side. Currently there are no cable trays running across the Klystron gallery in this area. This cabling is required for the "Phase 1" PPS that is scheduled to be certified in November.

Quotes are being obtained on the items required to fabricate the control room rack for the CHL ODH system. (These are items in addition to the PLC equipment that has already been procured.) The rack fabrications drawings were reviewed and final revisions were made prior to IFA.

For the Linac ODH system, an input/output list for the PLC was developed based on the plan views of the LINAC showing the locations of the warning beacons and PA speakers. A list of PLC components for the LINAC system was developed. These will be advanced procured to support PLC programming.

The DTL 4-6 Thermocouple box was inspected and small modifications identified to meet the specification. It should be ready for delivery next week. Test and checklist paper work has been filed. It will be delivered to RATS II.

The CUB (Central Utilities Building) Control Room console was set-up and is operational, and three new COWs ("Console on Wheels") were also set-up to provide operational support in the Front-End bldg.

The magnet test stand computer, monitor, IOC, and network connections are all in place. EPICS support should be ready when the power supply is. The magnet power supply IOC is ready for operation of the D-Plate magnets. First indications are that crashes in this IOC were due to a faulty PSC (Power Supply Controller) card. The system is running reliably with a new card.

At BNL, a motion control test stand was established for testing the movable devices associated with the HEBT and Ring collimation systems. The test stand includes an IOC and stepper motor controller board.

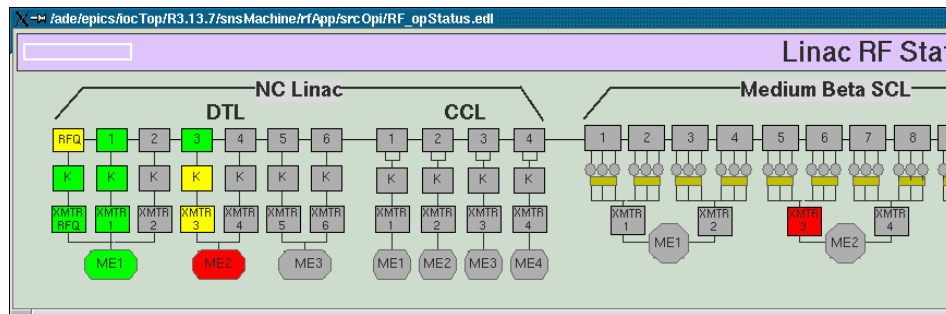
Calibration and checkout of the control system was started in preparation for the Central Helium Liquefier Purifier System readiness review. The operation and accuracy of all pressure transmitters for the purifier system has been verified. A calibration manifold, vacuum pump, and compressed nitrogen were used to check each pressure transmitter from 0 to up to 20 atmospheres pressure. Calibrated pressure test equipment was used to verify that the value displayed on the EPICS screen was correct. Checks were made at 0, 20, 50, 80, and 100% of full scale. Bar code equipment id tags and calibration stickers were attached to each transmitter. All calibration data was recorded and will be placed in ProjectWise. The data will be filed by the bar code equipment id number.

20% of the temperature sensors have been checked. This data will also be placed in ProjectWise.

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The controls team participated actively in the Accelerator Readiness Review held this week, with particular emphasis and interest in the Personnel Protection and Machine Protection Systems (PPS and MPS respectively). Presentations on both of these topics were made to the committee, and subsequent discussions and demonstrations were held. There were no "pre-start" findings for either of these systems. A small number of "post-start" findings will be dealt with in the next few days.

The Controls team participated in the analysis of data relating to the ME2 Klystron event. Considerable information was provided from the data archive to assist in the reconstruction of the sequence of events which led to the failure. A new screen was developed at the suggestion of the RF Group which will facilitate tracking of the state, including bypasses, of the complete Linac RF system. A section of that screen is shown below.



Installation of network cables to the diagnostic lab on the FE Building mezzanine was completed. Termination of CCL communications cables continued. Cable pulls from the klystron gallery to the tunnel are also being installed for the phase 1 PPS.

Work on the Oxygen Deficiency Hazard (ODH) system intensified this week. The specification document has been updated and an initial draft of the Integration Test Procedure developed. Pushbutton and keyswitch logic was added to the CHL PLC program. All of the quotes for the remaining CHL rack components have been obtained. These items will be ordered via a purchase requisition early next week.

The motion control system design was reviewed with Dave Gassner of BNL.

Functional System Documents for the SCL and Ring Vacuums were reviewed.

Work continued on the software for the Low-level RF (LLRF) systems. The screen hierarchy from LBNL was improved, the sequencers that calculate forward and reflected power and re-initialize after a communications disconnect were updated, and progress was made on a sequencer for the klystron curve tracer.

Installation

Craft Snapshot 8/12/03

ASD craft workers	71.0
Foremen, ES&H, etc	12.0
Less WBS 1.9 etc	12.0
Less absent	3.0
TOTAL	68.0

The RFQ was realigned and D-plate RCCS testing was completed

DTL #3 was ready for RF again. Flow meter issues were resolved and the RF window re-installed.

Testing of HVCM ME03 was started

Preparations for CCL assembly area in the tunnel were started.

DTL #4 Klystron piping installation will be delayed until August 18 to insure DTL #3 klystron is operational during the ARR.

All ten trailers of the 10-plex are on site and connected.

The second HEBT collimator was received.

The first beam line/vacuum components were installed in the HEBT between magnets Qv01 and QH02.

Power supplies for all the CCL quad have been received.

Cable pulling in and between the Ring and Ring Service Building was started.

“Stop Work” on the DTL_ME03 HVCM system is still in effect. It appears that DTL#3 klystron may condition after cleaning/plating of the cavity end wall.

Vacuum leaks in the MEBT were repaired.

The second MB cryomodule was received and placed in position in the tunnel.

The first helium and nitrogen loads were received at the CHL.

HEBT beam line components are installed from QV01 to QH04.

Accelerator Physics

S. Kim, D. Jeon, E. Tanke and S. Henderson completed a fault study analysis aimed at evaluating the potential for damaging the DTL structure during commissioning. The study found that for normal incidence on copper the MPS must shut off the beam in 5 microseconds. This results agrees with the previous estimate performed by Bob Shafer in 2001. Evaluation of grazing incidence was also carried out showing that for typical cases, the maximum pulse length is about 65 microseconds at 7.5 MeV and much longer at 2.5 MeV. These results have been incorporated into the DTL commissioning plan.

The “Drift Tube Linac Tank 1 Beam Commissioning Plan” has been finalized and approved. The plan contains the detailed step-by-step tasks to be carried out for commissioning.

J. Holmes has evaluated the impact of removing the Energy Corrector and Spreader cavities for 1 MW operation. Using slightly modified painting scheme the losses are a few times 10^{-4} and the beam-on-target parameters are within specifications.

Operations Group

The Operations Group prepared for and successfully passed the Accelerator readiness Review for DTL tank 1.

Ion Source Group

The RF amplifiers are now interlocked and have been tested. Both amplifiers drop out whenever an access port to the ion source, golden matcher, or the big blue box is opened. They cannot be turned on before all access ports are closed again.

The interlock and control scheme of all Ion Source and LEBT supplies and controllers has been thoroughly tested. A few surprises were found which will be discussed within the ion source group and addressed as needed. Most

important, however, is the confirmation that whenever one enters the big blue box, all supplies are disabled and drop out, except for the courtesy power and those supplies connected to “unswitched power” on the 65 kV platform. This zero energy state is reached whether or not one follows proper procedure when accessing the ion source, golden matcher, or big blue box.

We have revised and verified the equipment specific LOTO procedures for the Big Blue Box and the DTI 65 kV supply

The ARR committee mentioned our ion source checklist procedure favorably, because it is regularly updated. The most recent update of August 7, 2003, integrated the new RF interlock in the procedure.

We tested the 65 kV mode of the PPS system. It now works perfectly after the MPS was modified last week. The “65 kV” mode and the “Source RF” mode are essential for testing the readiness of the ion source when not being allowed to produce a beam.

Paul Gibson, Rob Morton, Syd Murray, Rob Welton, John Munro, Carl Lionberger, Yoon Kang and Martin Stockli were trained by Teresa Toomey in LOTO Verification Awareness. Following this training, Paul Gibson demonstrated the LOTO of the Big Blue Box and the DTI 65 kV supply. The demonstration yielded several suggestions for improving the procedure, which we are in the process of implementing. When completed, each person has to demonstrate a real LOTO on the Big Blue Box before being qualified to perform this procedure without supervision.

Syd Murray has prepared the hot spare stand for unattended operation. Its interlock will shut down the HV and the RF when the water flows or vacuum drop below certain levels or the air pressure is lost. If the vacuum rises above 1 mTorr, it will also shutoff the hydrogen and the Cesium heater.

We participated in the conditioning of the RFQ and DTL1.

Survey and Alignment

The Survey and Alignment group (for the past two weeks) has been performing the night network campaign. This campaign was not only to strengthen the existing network but also to incorporate the Target building into this existing network. At this time, the target network consists of over one hundred floor monuments. This target network will become very important when it comes to the installation of instrument groups beamline components.

The entire front end and DTL1 tank outside fiducials were mapped using the laser tracker. Upon completion of the mapping, the downstream end of the RFQ was lowered 0.5mm. This corresponds with what operations were observing. If this is the case, then we can suspect that the fiducialization of the RFQ with respect to the RFQ aperture (performed at and by LBNL) is incorrect.

The Survey and Alignment group performed a leveling campaign through the front end and out to our exterior network. Results show the front end is still sinking, although at a much slower rate.

The Survey and Alignment group laid out bolt hole locations for the first set of diagnostics in the HEBT. The stands were put in place and the layout was perfect. We are currently laying out the next set of diagnostics in the HEBT. This is a shorter diagnostic component than the first one we laid out. If this layout is correct, we can proceed in laying out the remaining diagnostic component stands.

The Survey and Alignment remeasured the ring plate elevations located in the target monolith for a verification of what was performed two weeks ago.

We are in the process of performing our monthly elevation campaign through the RTBT. As everyone is aware (or maybe not), the RTBT has considerable subsidence. We are monitoring this subsidence on a monthly basis.

We finished the level run from the RTBT to our outside network. This monthly campaign monitors the subsidence of the RTBT tunnel. From this campaign through the tunnel, we must tie this to our outside global network monuments. Results show a constant 0.3mm subsidence throughout the length of the RTBT.

We completed the layout of the diagnostics wire scanner stands in the HEBT. This makes way for the installation of the stands along with the wire scanners.

Additionally, BNL requested that we measure the two HEBT collimators for the bottom pin locations relative to the ends of the flanges. This "as built data" was required for the actual positioning of the collimators in the HEBT Tunnel.

Further HEBT work includes mapping of the diagnostic's wire scanner chambers and actual alignment of HEBT 12Q45 Magnets.

We are about 50% complete with the layout of Ring Half Cell bolt holes.

The Target group requested our assistance in laying out positions for the first set of bottom blocks. (The bottom blocks are located between the outer support cylinder and the inside of the bulk shield liner). This was a critical layout due to the fact that there is not much clearance between adjacent bottom blocks.

Data preparation is also underway for the layout of additional support stands in the HEBT and RING.

Mechanical Group

Water Systems Installation

SCL-ME1 Piping from TRCC Carts to Equipment is progressing.

Flow meters were installed on the RFTF test stand manifolds and additional drains and hose bibb fittings were installed throughout the facility.

Piping from Waveguide Chase #44 to the future QMCS manifold was started.

Pipe fitters installed additional sets of water loads for the SCL waveguide system.

Pipe fitters started welding the HEBT Beamline support stands.

Modifications and upgrades to the RFTF piping have been completed.

CCL-4 piping from the RCCS skid to the Linac tunnel continues.

Fabrication of the QMCS magnet manifold piping for the SCL Medium Beta was started.

Piping to the DTL 4 klystron was started.

Pipefitters installed another set of water loads for the SCL waveguide system.

The water loads provided by BNL for the RING magnet cooling system have been evaluated.

Preliminary design of the collimator cooling systems is almost complete.

RING Systems Installation

HEBT collimators #1 and #2 were received and staged in the HEBT tunnel.

Additional HEBT collimator shielding was received.

Additional HEBT beamline support components were received.

The first HEBT Wire Scanner (WS01), Beam Current Monitor (BCM01) and Drift Pipe (DP01) were installed between magnets QV01 and QH02.

Cable pulling from the Ring Service Building to the HEBT was started.

Cable tray installation in the RING Service Building continues.

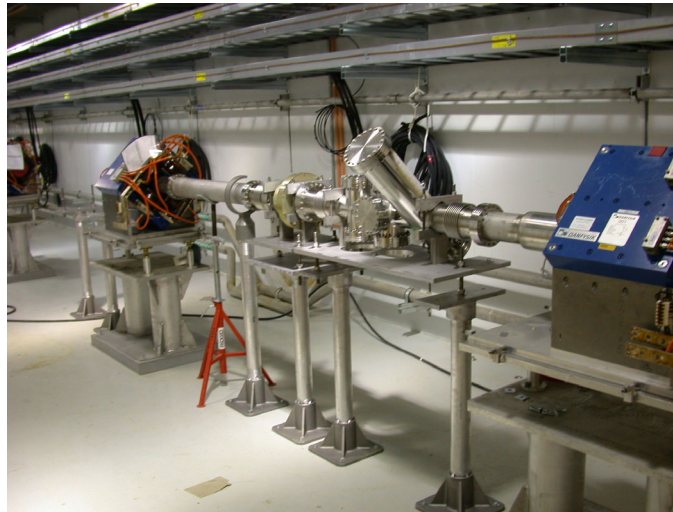
The beamline section between HEBT magnets QH02 and QV05 was installed.

As-built measurements of HEBT collimators #1 and #2 were taken and sent to BNL for preparation of shielding installation.

Additional HEBT beamline vacuum pipe components were received.

Assembly of the beamline diagnostic support continued.

Design of the HEBT vacuum pump support structure continued.



Magnet Task

We measured the last two DTL EMD's and forwarded them to LANL.

We installed another beam tube in a 12Q45.

We continue setup and checkout of the 21Q/27CD mapping system.

We have started re-starting CCL Quadrupole mapping

Electrical Group

DTL modulators ME1 and ME2 are available to support operations. DTL ME1 was operated this week by the operations group.

SCL modulators SCL2 and SCL3 passed their acceptance tests at Dynapower the week of July 28 – August 1, 2003. Dave Anderson was at Dynapower to witness the tests.

DTL modulator ME-3 (for DTL 5 and 6) has been installed and tested at full voltage into a resistive load. It is currently being connected to the klystrons for final installation testing next week.

Upgrade parts for the RF Test facility modulator have been received – final upgrades to full 1 MW average power will be completed next week.

SCL ME1 modulator oil tank components have completed their incoming inspection and performance upgrades. The SCL enclosure has been installed in the SCL 1 area in the klystron gallery. SCL ME1 is awaiting the completion of the electrical and pipefitting installation before installation can be completed.

Work on the CCL ME1 modulator has started, and preparations are being made in the klystron gallery to install this modulator.

All CCL (14) power quadrupole power supplies have been delivered. Testing will start next week.

The first 6 (of 42) SCL quadrupole supplies have been delivered.

The ring tray installation is complete. Work is progressing on the Ring Service building tray installation and the first magnet cables have been pulled from the Ring Service Building to the HEBT magnets power from this building.

Linac electrical work this week concentrated on the CCL area, as the SCL 1 area was occupied by pipefitters.

Four more SCL quadrupole magnet power supplies arrived this week, bringing the total received to 10 (out of 42). One power supply in this shipment had shipping damage and was rejected and will be returned to the vendor for repair (one SCL quadrupole power supply from last week's shipment had very minor damage and was provisionally accepted pending testing).

Testing started on the CCL quadrupole power supplies. One CCL quadrupole power supply had insufficient over-temperature protection and failed in testing. These power supplies, which are water cooled, do not have water flow interlocks. They depend on temperature sensors instead. The manufacturer has been contacted to determine what corrective action is needed.

Modulator ME2 was inadvertently left in an interlock bypass mode after service to upgrade the emergency off switch by the Electrical Systems Group. Because of this bypass, the HVCM was turned on by operations/rf with DTL3 klystron in a not ready state with the filament on but with the focusing magnet off (a condition normally not allowed by the interlock). Some damage occurred to the DTL3 klystron, which is now being assessed. Meanwhile, operational procedures have been developed to track maintenance interlock bypasses and to test all interlocks on modulators after each maintenance. A longer term solution ('90 days) of adding additional hardware interlocks to eliminate the need for interlock bypass switches is being developed. The klystron damage incident that had occurred at LANL a few months ago was caused by mistakenly interchanging interlock wiring. This failure mode is also being addressed by our operational procedures and hardware upgrades.

All HVCM units were upgraded to include automatic transmitter transition to "Filament Off" mode in the event of a transmitter bypass and a software-implemented lockout of the RUN command from EPICS when all transmitters are bypassed at the HVCM Control Chassis. An administrative procedure was developed to check the status of RF stations returned to operational service at the termination of a maintenance cycle.

Safety enclosure wiring continued on installed units in the Klystron Gallery this week. CCL-ME1 was installed in its oil tank, and should be in place, wired, and plumbed next week. DTL-ME3 finished its checkout phase, with only a voltage divider calibration remaining. SCL-ME1 preparation work was nearly completed. Water cooled heatsinks for the RFTF modulator were finished and installed this week. RFTF modulator should be operational next week.

HPRF

The seventh 402.5 MHz 2.5 MW klystron arrived and was placed on an HV tank located at DTL4. The lift was expedited and was less risky for the klystron because of the recently installed extension of the concrete pad at the Gallery roll-up door. We expect to plumb this klystron next week when DI water can be shut off. This will complete all HPRF equipment through the DTL. Commissioning, calibration and testing still remain on DTL RF systems 2,4,5,6.

A revised plan was implemented among Water Systems, Electrical and RF Groups permitting more efficient installation of the superconducting section of the Klystron Gallery. The SC installation is significantly more congested than the NC

Modified the design of the klystron socket supports for the 402 MHz klystrons so the contact rings are adjustable. This solves a problem where variations in the klystron dimensions have either caused the contacts to be barely touching on some klystrons or crushing the spring contacts on other klystrons. Modified DTL 5 & 6 HV tank klystron sockets to properly compress the spring contacts. Other DTL HV tank socket modifications to follow. This will make the tanks more suitable for interchanging klystrons.

Six 550 kW, 805 MHz klystrons are controlled by each rf SCL transmitter. The waveguide (including water loads and circulators), electrical tray/conduit and water piping for these klystrons are very dense and some waveguide components are barely accessible. A plan was developed with the Water Engineering group to provide access to RF Waveguide components by installing flanges and drains at key locations in the system. The Electrical and Water groups are coordinating the installation effort and we will incorporate our experience into smoothing the installation of the remaining thirteen SCL transmitters.

The DTL3 klystron developed a vacuum leak. An on-going investigation into the cause of the leak determined that the cathode voltage was turned on when the transmitter wasn't ready for high voltage. This was traced to a maintenance switch being in the wrong position. Corrective action was taken to electrically prevent this from occurring again. Administrative procedures are also being implemented to insure this condition can not be repeated. After cleaning the exterior of the tube with alcohol, the leak sealed itself and the vacuum is now back to original levels ($< 1\text{E-}9$ Torr). A plan has been developed to permanently seal the tube and will be executed next week. Rf measurements on the tube show no significant changes from original rf characteristics. We'll continue to report on tube progress.

On the 9th around 2:00 am 125KV was applied to the DTL 3 klystron while the focusing magnets were off. The DTL 3 transmitter ready for high voltage signal which permits HV to be applied was bypassed at the HVCN via a bypass dip switch. A full report with corrective action was given to the division. Klystron rehabilitation will commence early next week with full recovery expected soon after. Pipefitters are having problems installing water connections to the SC klystrons and waveguide. They cannot get to the gallery ceiling to install support rods; we are considering supporting pipes from the waveguide supports or the cable tray supports. The installation will take longer than expected.

LLRF**Cryo Systems Group**

The transfer line supply and return end cans have been set and anchored.

Praxair has completed the site inspection and certification for LN2 and Helium deliveries next week.

Work continues on the 2K cold box warm piping.

Coupler alignment is completed on 4 of the 6 warm helium compressors.

Work continues in the tunnel on the orbital welding of the helium purge system. Work is completed on the vacuum and cool down headers.

We have accepted our first delivery of LN2, 7000 gal. have been delivered to the 20,000 gallon dewar. Further deliveries of 7000 gal. each, are scheduled for the following 2 Mondays. The boil off from the LN2 is used to purge the refrigerator system of moisture. We also took on 45,000 cubic feet of helium. This helium will be used, with the purifier, to clean up the refrigerator system of nitrogen and other contaminants.

We continue to build "U" tube sub assemblies. The first supply "U" tube was built and successfully tested on the Cryomodules

Cryomodule medium beta 02 was installed in the tunnel this week. Initial transportation shock log readings and vacuum checks indicate an uneventful shipment. Photos attached.



Beam Diagnostics

BNL SNS Beam Diagnostics Progress Report:

Refining the Spares PCR. Working on manpower and materials estimates for FY04. Received latest Lab VIEW template file from Wim Blokland. Submitted first draft of Cable PCR to BNL management for review.

1.5.7.1 BPM: Completed SNS RF BPM layout. Board is going out for fabrication.

1.5.7.2 IPM: Detailed design of vacuum chamber continues. Power supplies for the IPM magnets are being reviewed.

1.5.7.3 BLM: Continue to prepare an AFE chassis, AFE modules; MPS interface module, and additional ion chamber detectors, for delivery next week. Three BNL representatives will travel to ORNL to support this delivery. Design effort for the detector mount continues. A variety of styles are required for the many locations. Status of the 295 ion chamber order with LND: "Advance Notice" has been signed by the Competition Advocate and the Contract Review Board and is now at DOE.

1.5.7.4 BCM: Received the production quantity (50 pieces were cheaper than 30!) BCM AFE/digitizer boards. Most components have been ordered, only the DC-DC converters and a few ICs remain. Parts kit has been prepared for stuffing of 30 boards. Quote for stuffing is expected today. Investigation of compatibility problems between the LANL PCI card and the new rack-mount PC (selected by ORNL) continues. Delivery schedule of the spare electronics for DTL commissioning dictates that we order additional old-style motherboards to meet delivery. Work continues on the Ring BCM design to accommodate the larger Bergoz torrid. Final dwgs for the RTBT BCM are still in checking.

1.5.7.6 Wire Scanner: After final check on dimensional compatibility, gave LANL the go-ahead to proceed with orders and fabrication. Continued work to incorporate a scraper at the root of the Ring wire scanner fork.

1.5.7.7 Beam-in-Gap: Continued working on kicker detail drawings

1.5.7.8 VFM: Continue setting up video test mock-up in the video lab. Many small parts have been ordered as well as work requests to the machine shops for components for the neutral density filter assemblies. Mechanical designer has simulated what the electron catcher may look like based on the optical angles and required mirror.

Electron Detector: Continuing detector tests.

LANL SNS Beam Diagnostics Progress Report:

BPM pickups: All DTL pickups are being assembled into the drift tubes in preparation for e-beam welding. We are paying special attention to cable routing and protection. In addition to getting rid of the stem-to-body weld, the cables are now encased in a fiberglass sleeve. Continuity checks will be made before and after welding, which is now scheduled for about Sept. 8.

BPM electronics: John Power was absent this week, so no new input. However, it was reported that the two chassis that were supposed to be shipped to ORNL last week have not yet been sent.

WS pickups: Huntington reports they are still on schedule for the 6-inch (DTL) and 3-inch (CCL) actuators to go into assembly the last week of August. If all goes well it is possible that the first one of each will ship the first week of September as planned. This schedule, however, depends on Huntington's vendors meeting their promised delivery dates, some of which are close to the last week of August.

WS electronics: We were notified by ORNL of their decision to retain the standard NI (chopped) stepper-motor drivers, so procurement can proceed. LANL engineers and technicians met last week to discuss differences required for the ring and RTBT electronics from that used in the linac and HEBT. Our purpose is to allow fabrication to proceed on as much of the electronics as possible while the team is still intact. John Power proposed modifications to the input for charge integration and single-shot digitizing, as opposed to the linac-HEBT design, which is current sensing with multiple samples digitized and averaged. One question was: "In what mode will the ring wire scanners be operated?" This determines the peak current as well as the 1-MHz repetition rate. John will follow up with BNL and Mike Plum to get a resolution of this question. In the meantime, we determined that the stepper motors and PCs would not change, so orders can be placed for these components. We ordered 35 stepper-motor drivers from NI, which includes the 26 original (linac-HEBT) plus nine additional (ring-RTBT) units. We have all but two of the electronic chassis put together and tested. We still have the bandwidth test to do on each of the chassis, which should take about three days. So we are coming along quite well in that area.

Harp pickups: Robert Valdiviez has joined LANSCE-2 and is providing liaison for the harp pickups. The design drafting is about 50% complete, and we are looking at the stackup tolerance of the seven plates. We will make a two-plate aluminum model before proceeding to full fabrication. Bids for the wire crimps are expected next week.

Deliverables spreadsheet: No major changes since the version of July 25, so the spreadsheet is not attached.

Organization note: Hamid Schoae (SNS-4 group leader) will be assuming the SNS diagnostics management (Bob Hardekopf is taking on additional duties as acting deputy division leader). Bob will continue to work on the diagnostics estimate-to-complete in preparation for turning responsibility over to Hamid, and he will also maintain some involvement in his new division role.

ORNL SNS Beam Diagnostics Progress Report:

Anti-chopper (D-box) Diagnostics:

We added two more actuators to the D-box. At present we have two water cooled slits, a new beam stop, a Viewing screen, and an assembly for the water-cooled beam aperture. Tom Roseberry led the installation support from the

vacuum group [Randy McPherson], Mechanical support [Robert Morton], and the diagnostic group [Andy Webster, Dave Purcell and the new diagnostic group member [Bill McHargue]. We propose to install the beam aperture on Friday Aug-22-2003.

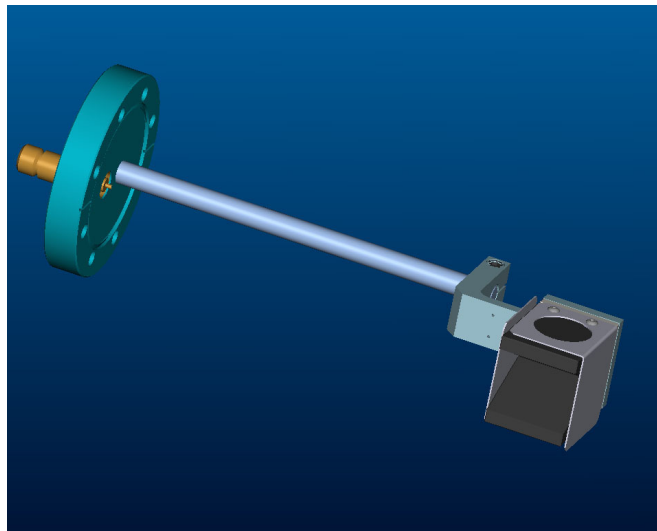


Fig-1) The new Beam stop.

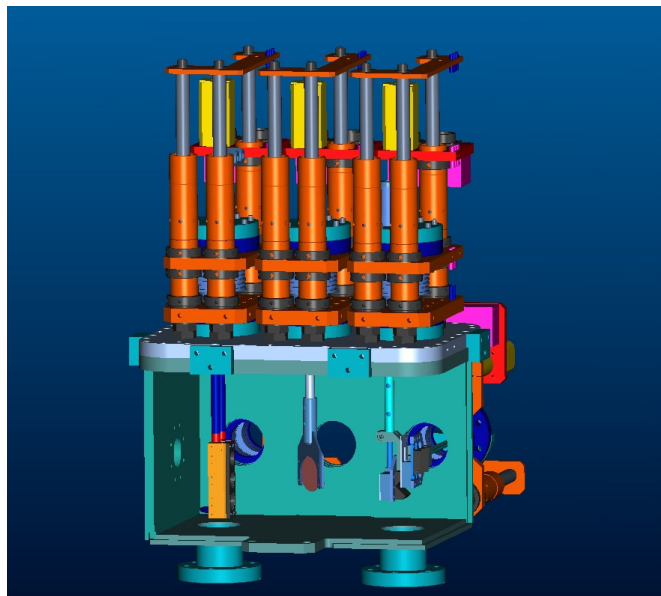


Fig-2) Arrangement of the actuators as installed in the front-end building.

BLM Test Stand:

The design of the Cs-137 source enclosure is complete [see fig-3]. The design team led by Kerry Potter. Konrad Rykaczewski finished the design prior to going back to school. We appreciate his fine work. We expect the BLM test stand to be online within the next two months.

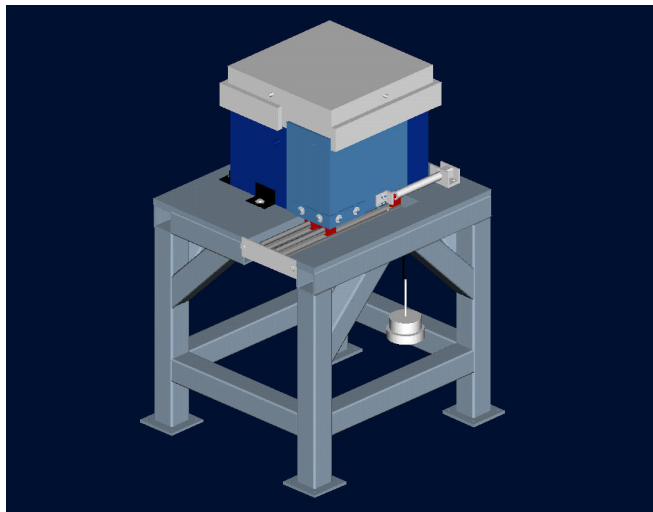


Fig-3) Cs-137 source enclosure is shown. We expect to send out the bid for manufacturing in about 1-2 weeks.

HEBT BPM Test Stand: All parts are at hand. 50% of the automated data acquisition is complete. We will be ready to field test by the middle of September.

LANL D-plate: D-plate is ready for beam testing. All components were checked out, The MPS, collision avoidance, magnet, cooling, air and vacuum were vertically and horizontally checked out. We are still concerned about the unwanted long cables required upon us during the installation. We observe excessive noise on emittance scanner signal cables. We are looking into gating the signals via software manipulations [disabling the stepper motors as we take data].

BPMs: the ORNL diagnostic team redesigned the BPM Roscoe reference line for the first phase of MEBT/Tank-1/D-plate commissioning. We installed the frequency distribution boxes in the FE and Klystron gallery. We are also pursuing less complicated alternatives such as fiber distribution. We are looking into alternative BPM Phase measurements. The BPM design engineer, John Power is still working on the LLR. We hope to have him come to the ORNL to work on the BPM electronics with us. before the commissioning starts. We observe an enormous noise on the BPM system.

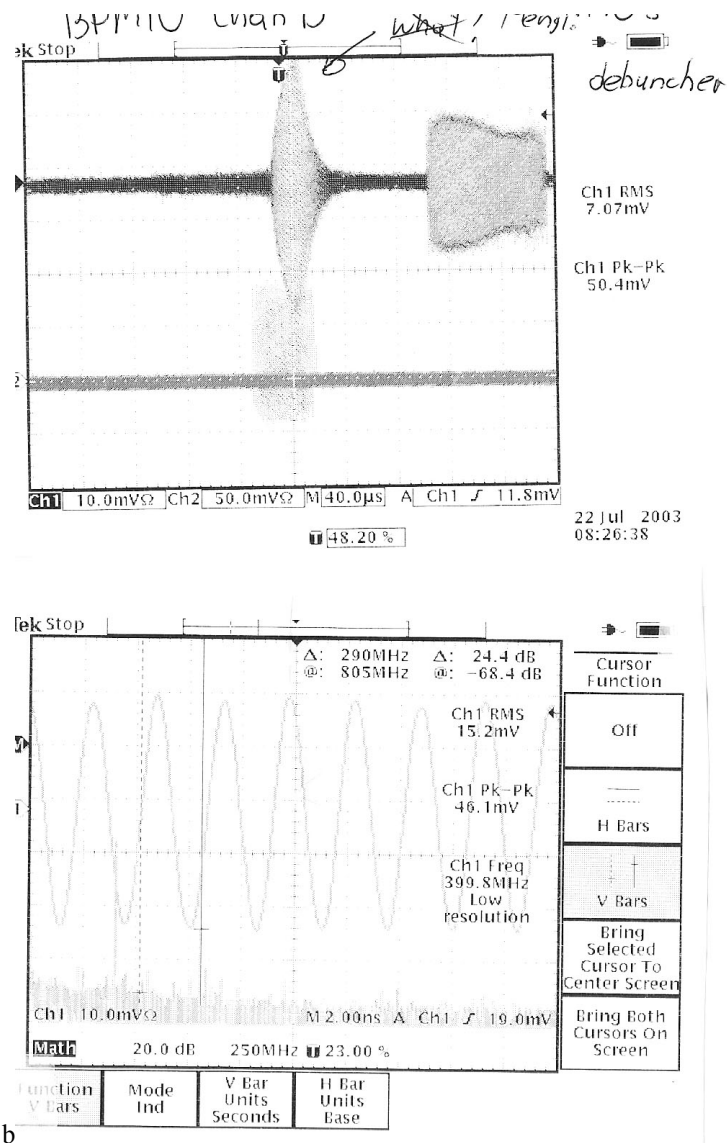


Fig-4) Noise from the re-buncher cavities on the BPM electrodes and cables. The top trace is the noise from the re-buncher cavity, the bottom trace and the magnified trace (the bottom picture) is the timed BPM signal. As seen, the noise is by far bigger than the signal.

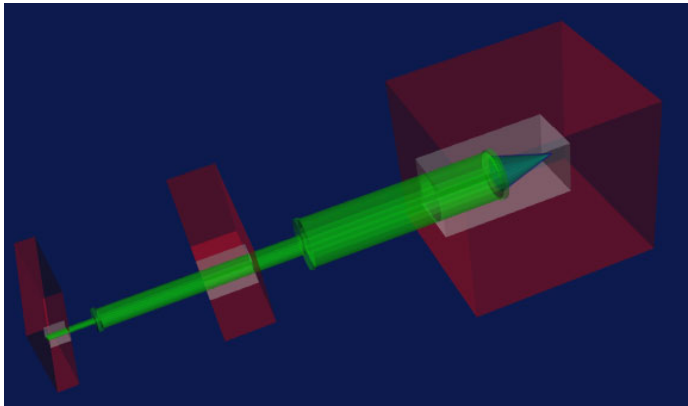


Fig-5) Original poly shielding design by the diagnostic group.

For the above geometry, we expected 20 mrem/hr outside of the iron shield wall. Since then the design has changed by the DTL installation group and the radiation safety group. We are redoing our calculations for the new poly shielding table configuration.

The new configuration is compact as shown below. Calculation will be posted by next week.

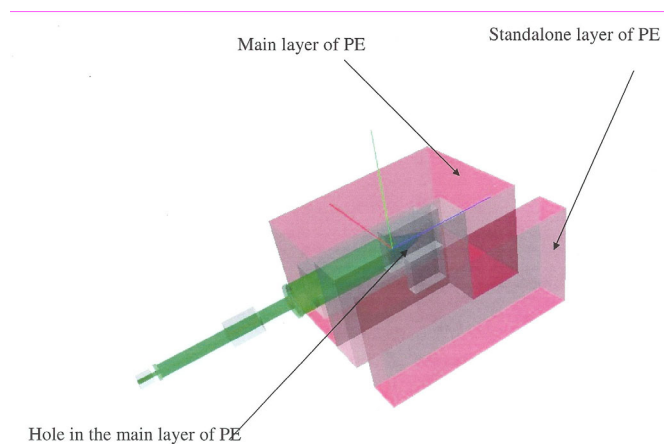


Fig-6) There is a hole to provide access to the water cooling in the new poly shielding geometry.

Mezzanine Setup: The diagnostic group is in the process of moving the pre-installation checkout and test stands into the mezzanine just above the FE. We thank Don Smith for his support. Workbenches are assembled and the equipments are moved to the RATS-II. We are waiting to move all heavy components by DB from RATS-II to the mezzanine.